AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A semiconductor optical modulator comprising at least:

a lower cladding layer of a first conductivity type;

a light absorption layer which is formed on said lower cladding layer and has a quantum-well structure constituted by a quantum-well layer and a barrier layer; and

an upper cladding layer of a second conductivity type formed on said light absorption layer,

wherein the quantum-well layer is made of $In_{1-x-y}Ga_xAl_yN$ ($0 \le x, y \le 1, 0 \le x+y \le 1$),

the barrier layers is made of $In_{1-x'-y'}Ga_{x'}Al_{y'}N$ ($0 \le x', y' \le 1, 0 \le x'+y' \le 1$), ~~and~~

an optical waveguide having a light incident end is constituted by said lower cladding layer, said light absorption layer, and said upper cladding layer,

polarization is produced in the light absorption layer in the absence of a bias, and

the light absorption layer is depleted by the polarization and a p-n junction built-in voltage.

2. (Original) A modulator according to claim 1, wherein said light absorption layer includes a multiple-quantum-well structure.

3. (Original) A modulator according to claim 1, wherein said lower cladding layer is formed on a predetermined substrate.

4. (Cancelled).

5. (Original) A modulator according to claim 4, wherein the polarization is spontaneous polarization produced in said light absorption layer.

6. (Original) A modulator according to claim 4, wherein the polarization is the sum of spontaneous polarization and piezoelectric polarization produced in said light absorption layer.

7. (Original) A modulator according to claim 4, wherein the quantum-well layer and the barrier layer have different lattice constants.

8. (Original) A modulator according to claim 7, wherein the quantum-well layer has a larger lattice constant that the barrier layer.

9. (Original) A modulator according to claim 7, wherein the quantum-well layer has a smaller lattice constant than the barrier layer.

10. (Original) A modulator according to claim 4, wherein the quantum-well layer comprises crystal InN, and the barrier layer comprises crystal GaN.

11. (Currently Amended) A laser with an optical modulator, comprising a waveguide type semiconductor laser and a semiconductor optical modulator which are integrated on a single substrate,

wherein said semiconductor optical modulator includes at least a lower cladding layer of a first conductivity type formed on a substrate, a light absorption layer which is formed on the lower cladding layer and has a quantum-well structure constituted by a quantum-well layer and a barrier layer, and an upper cladding layer of a second conductivity type formed on the light absorption layer, the quantum-well layer is made of $In_{1-x-y}Ga_xAl_yN$ ($0 \le x, y \le 1, 0 \le x+y \le 1$), the barrier layers is made of $In_{1-x'-y'}Ga_{x'}Al_{y'}N$ ($0 \le x', y' \le 1, 0 \le x'+y' \le 1$), ~~and~~ an optical waveguide having a light incident end is constituted by the lower cladding layer, the light absorption layer, and the upper cladding layer, polarization is produced in the light absorption layer in the absence of a bias, and the light absorption layer is depleted by the polarization and a p-n junction built-in voltage.

12. A laser according to claim 11, wherein said optical modulator includes a multiple-quantum-well structure.

13. (Cancelled).

14. (Original) A laser according to claim 13, wherein the polarization is spontaneous polarization produced in the light absorption layer.

15. (Original) A laser according to claim 13, wherein the polarization is the sum of spontaneous polarization and piezoelectric polarization produced in the light absorption layer.

16. (Original) A laser according to claim 13, wherein the quantum-well layer has a larger constant than the barrier layer.

17. (Original) A laser according to claim 16, wherein the quantum-well layer has a larger constant than the barrier layer.

18. (Original) A laser according to claim 16, wherein the quantum-well layer has a smaller lattice constant than the barrier layer.

19. (Original) A laser according to claim 13, wherein the quantum-well layer comprises crystal InN, and the barrier layer comprises crystal GaN.

20. (New) A semiconductor optical modulator comprising at least:

a lower cladding layer of a first conductivity type;

a light absorption layer which is formed on said lower cladding layer and has a quantum-well structure constituted by a quantum-well layer and a barrier layer; and

an upper cladding layer of a second conductivity type formed on said light absorption layer,

wherein the quantum-well layer is made of $In_{1-x-y}Ga_xAl_yN$ ($0 \leq x, y \leq 1, 0 \leq x+y \leq 1$),

the barrier layers is made of $In_{1-x'-y'}Ga_{x'}Al_{y'}N$ ($0 \leq x', y' \leq 1, 0 \leq x'+y' \leq 1$),

an optical waveguide having a light incident end is constituted by said lower cladding layer, said light absorption layer, and said upper cladding layer,

polarization is produced in the light absorption layer in the absence of a bias, and

the modulator can be operated without injecting any current in the presence of a forward bias.

21. (New) A laser with an optical modulator, comprising a waveguide type semiconductor laser and a semiconductor optical modulator which are integrated on a single substrate,

wherein said semiconductor optical modulator includes at least

a lower cladding layer of a first conductivity type formed on a substrate,

a light absorption layer which is formed on the lower cladding layer and has a quantum-well structure constituted by a quantum-well layer and a barrier layer, and

an upper cladding layer of a second conductivity type formed on the light absorption layer,

the quantum-well layer is made of $In_{1-x-y}Ga_xAl_yN$ ($0 \leq x, y \leq 1, 0 \leq x+y \leq 1$),

the barrier layers is made of $In_{1-x'-y'}Ga_{x'}Al_{y'}N$ ($0 \leq x', y' \leq 1, 0 \leq x'+y' \leq 1$),

an optical waveguide having a light incident end is constituted by the lower cladding layer, the light absorption layer, and the upper cladding layer,

polarization is produced in the light absorption layer in the absence of a bias, and

the modulator can be operated without injecting any current in the presence of a forward bias.